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SOME INTERESTING STUDIES ON SPIDER ANATOMY

By
E. W. ROBERTS

On studying the spider *Anglena* I was struck by the lack of conformity of the material with descriptions of the class given in prominent text books. For instance, in Parker and Haswell's *Zoology*, vol. 1, page 615, the pedipalpi of spiders is described thus: "The pedipalpi (Fig. 506, B) are elongated, and end in simple extremities; in the male (Fig. 507) the *terminal* joint is modified to serve for the reception and transference of the sperms." In the pedipalpi of the male *Anglena*, we find the third from the end, not the terminal joint, serving as a very highly modified intromittent organ. The pedipalpi (Fig. 1) are composed of at least 9 separate segments as I have numbered them from the extremities inward. Segment 1 is modified into a terminal clasper, or claw. Segment 2 is a much enlarged gland and olfactory joint; there are two large areas of perforated openings, one of which gives off sexual odors, while the smaller perforated area consists of olfactory cells. This joint during sexual contact is placed directly over the stigmati or air chambers which open into the book-lungs. Thus in this case the book lungs function in an entirely new light as olfactory organs. Segment 3 is modified into a very complicated intromittent organ, which is shown greatly enlarged in photo No. 2.

In preparation for mating, the male spins a mat of web which is held under the sexual vents and the sperms emitted thereon. This web with its contents is then brought forward and the end of the joint marked A is inserted in the fluid mass which is sucked through slit apertures into the large coiled storage glands on which I have indicated the direction of the flow by arrows. The large gland makes about one complete turn and ends in a minute tube which terminates outward in the true intromittent organ marked B. During copulation the male, watching his chance, rushes behind the female and grabs her around the neck of the abdomen and inserts the terminal B in the small vaginal vents which are shown as a pair in photo No. 3 and marked A-A.

The stigmati c-c are situated external to the vaginas and are marked B-B. In this position the large gland organs of joint 2 come into position over the stigmati of the further side, while joint 1 clasps its claw further up the side.

Segments 4-8 are well represented in the illustration. Segment 9 is enlarged (Fig. 4) forming two lips which contain the most highly developed nervous system of any organ in the body.

The nerve cord spreads out fan-wise, divides into thousands of terminals which end in the minute cuticular hairs or spines. These hairs dip into the blood of the victims and are probably gustatory in function.

In Parker and Haswell's Zoology, vol. 1, page 612, order 6, Araneida. "Arachnida in which the body is composed of an *undivided* cephalothorax and an unsegmented abdomen." The claims of most textbooks on the "undivided head and thorax" of this class, may suit the men who proposed the term of cephalothorax, but to students of anatomy it is more or less unfounded as I will try to show. It is doubtful if the head structures and the thorax structures have ever coalesced or fused as some casual outer views would indicate. The neck of spiders is as large as the thorax and is doubtless made so by the fact that in bulk with its appendages it is as large as the true thorax. I have no doubt that the full sized neck of spiders more nearly approaches the ancestral types of Arthropoda than that of Diptera which are reduced in some cases to a mere stalk. But this would not keep a spider from having as true and anatomically complete head as a fly or bee. Fig. 5 is a long vertical section of the head and thorax of a female *Anglena* spider. The line marked E is the true division of the head and thorax structures, there is no sign of structural coalescence. In the thorax, figures 1-4 indicate the four legs and the corresponding muscles which move them. A glance will show the head and thorax structures nearly balanced in bulk, but entirely distinct regionally. The pedipalpi (A) form the lower lip, the lower neck fold being between this and the fourth thoracic leg. B is the relatively enormous chelicerae, the eye and the poison gland of the chelicerae are represented at B, C, and D. Fig. 6 shows the head of a male *Anglena* spider and several additional features. On the side of the head prominent folds of neck skin project forward above the eye C and is designated E. This may be the same neck fold which bending front or back is called a carapace. A is the pedipalp base and B the chelicerae. The brain ganglia of the head (D) lie forward of and in close contact with the thoracic ganglia.

In spiders the nerve ganglia of the head and thorax form one long brain body, but there is no coalescence or fusing of the ganglia. The nerve trunks of all the head appendages still run to their proper brain lobes and are easily followed out in sectioned material. The only thing that has happened to the ganglia is the shortening of the trunks between ganglia and their approachment to each other.

In Parker and Haswell's Zoology, page 612, order 7, Acarida we find the following "Arachnida in which the body exhibits no division into regions." And on page 616 "In the Acarida or Mites and Ticks (Figs. 508 and 509 the distinction into regions is no longer recognizable." In my specimens of *Trombidium fuliginosum* there is a small but distinct fold on the ventral side between the abdomen and thorax, while the

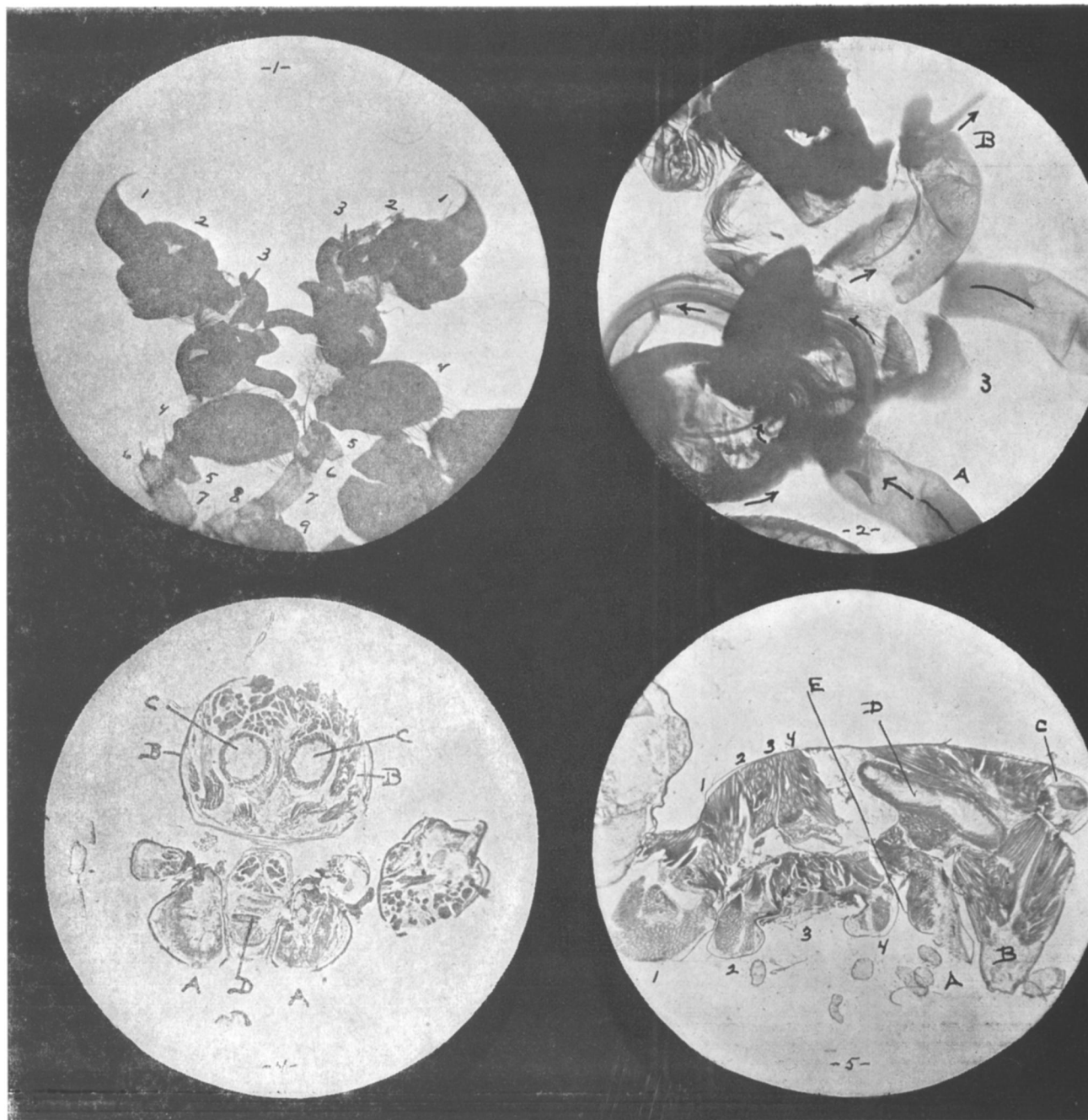


PLATE XII

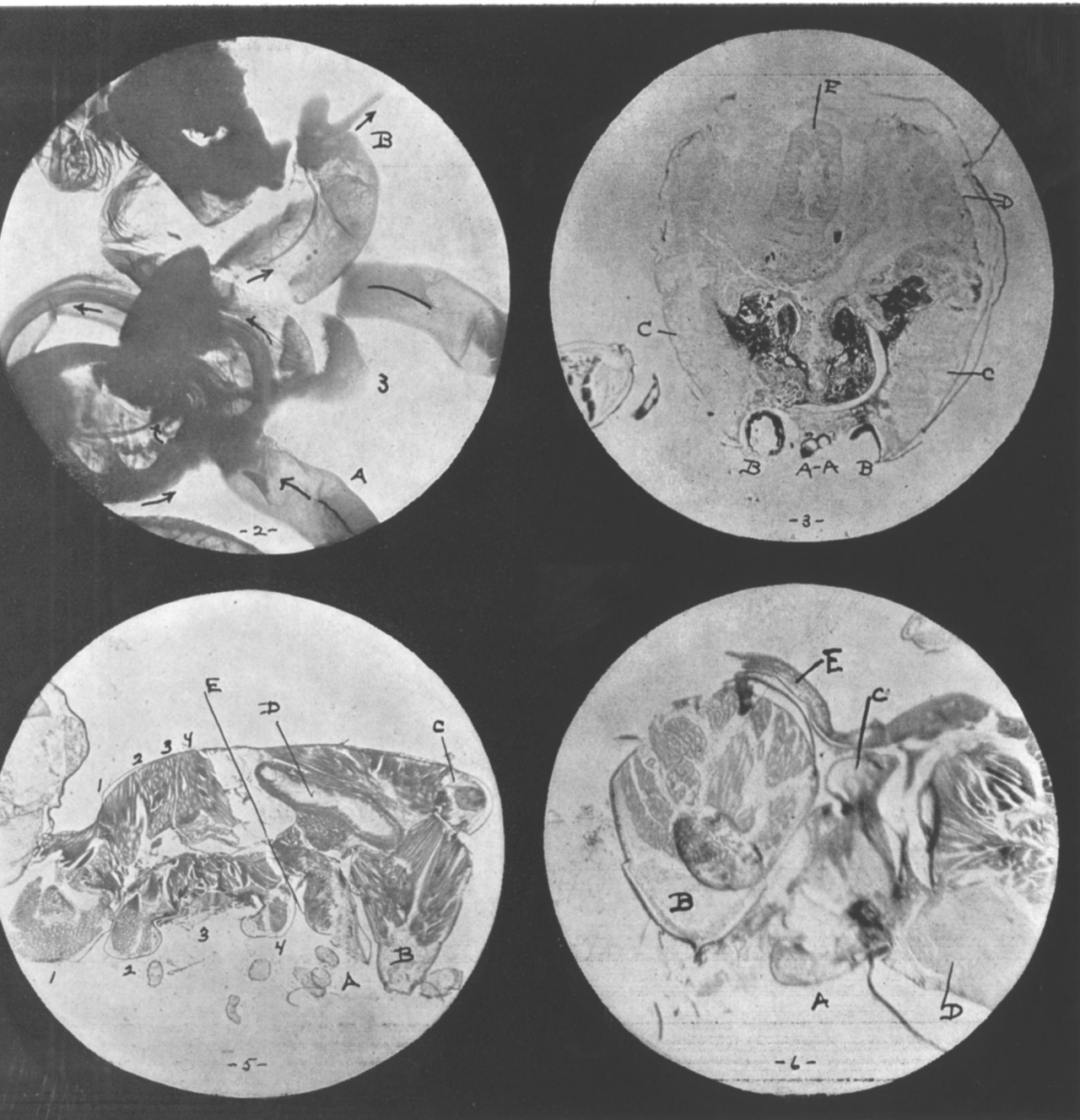


PLATE XII

stigma lie in their proper place just to the rear of the fold, the same position as they take in spiders. In the fig. 508 of the itch mite *Sarcoptes scabiei* which they give the abdominal fold and the stigma just to the rear are plainly in view. These points are of minor importance, but, if they are correct anatomy why would they not be correct for teaching purposes.

EXPLANATION OF PLATE

Fig. 1, *Anglena*—male spider—organs pedipalpi; 1, terminal claw; 2, scent gland. 3, intromittent organ. 4, large oval clasp segment; 5, 6, 7, 8, small segments; 9, highly developed segments which form lips for the mouth.

Fig. 2. Enlarged view of intromittent segment. *A* is the intake of the storage tube, the arrows indicating the direction of the flow. *B* is the outlet of the storage tube which is furnished with a shoulder to prevent too deep insertion.

Fig. 3. Section of anterior abdomen of female spider, cut through stigmas and vaginas. *A-A*, vaginal openings, *B-B*, stigmas; *C-C*, booklungs; *D*, liver; *E*, heart.

Fig. 4. Section through head of male spider. *A-A*, lips; *B-B*, chelicerae; *C-C*, poison glands; *D*, mouth.

Fig. 5. Long vertical section of head and thorax of female spider. *A*, lower lip. *B*, chelicerae; *C*, eye; *D*, poison gland; *E*, neck; 1, 2, 3, 4, legs and the muscles which move them.

Fig. 6. Long vertical section of head and thorax of male spider. *A*, lip or pedipalpi; *B*, chelicerae; *C*, eye; *D*, brain; *E*, neck fold or carapace.